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Secondary Prevention Through Cardiac Rehabilitation

Position Paper of the Working Group on Cardiac Rehabilitation and Exercise Physiology of the European Society of Cardiology

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The purpose of this statement is to provide specific recommendations in regard to evaluation and intervention in each of the core components of cardiac rehabilitation (CR) to assist CR staff in the design and development of their programmes; the statement should also assist health care providers, insurers, policy makers and consumers in the recognition of the comprehensive nature of such programmes. Those charged with responsibility for secondary prevention of cardiovascular disease, whether at European, at national or at individual centre level, need to consider where and how structured programmes of CR can be delivered to the large constituency of patients now considered eligible for CR.

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Introduction

Atherosclerotic cardiovascular diseases are the major cause of death in middle-aged and older adults in most western countries, including Europe. In addition, atherosclerotic diseases, of which coronary artery disease is the most common, result in substantial disability and a loss of productivity, and contribute considerably to the escalating costs of health care, especially in regard to an ageing population. For those patients already identified as having cardiovascular diseases, the prevention of subsequent cardiovascular events while maintaining adequate physical functioning and independence and a good quality of life are thus major challenges in preventive cardiology.^{1–6} The results of EUROASPIRE II⁶ and other contemporary studies show that to many patients are not receiving appropriate evidence-based therapeutic interventions or health behaviour advice and, as a consequence, most are not achieving the recommended secondary prevention goals. Thus, despite the increasing body of professional recommendations on coronary prevention at both national and European level, integration of cardiovascular disease prevention strategies into daily practice is still inadequate. Comprehensive cardiac rehabilitation (CR) is probably the most effective approach for cardiovascular risk reduction and long-term care of cardiac patients as well as of subjects with multiple coronary risk factors.^{4,7–18} Available economic evaluations suggest that comprehensive CR is a cost-effective intervention following an acute coronary event and is economically justified.¹⁵ Secondary prevention, through CR programmes, is now recognised as an essential component of the contemporary management of patients with various presentations of coronary disease and with heart failure and it should be integrated into the long-term care of all patients with cardiovascular disease.^{4,5,7,8,10–18} Yet, both physician referral to and, separately, availability of comprehensive CR and prevention programmes are still inadequate in Europe.^{6,19}

The purpose of this statement is to provide specific recommendations on the core components of CR with special emphasis on the design and development of a multifactorial, integrated approach for comprehensive cardiovascular risk reduction and effective secondary prevention.

Evolution of cardiac rehabilitation and definition

CR programmes were first developed in the 1960s when the benefits of ambulation during prolonged

hospitalization for coronary events had been documented. Exercise was the primary component of these programmes. They were predominantly offered to survivors of uncomplicated myocardial infarction and initiated at a time remote from the acute event. Concern about the safety of unsupervised exercise after discharge led to the development of highly structured rehabilitation programmes that were supervised by physicians and included electrocardiographic monitoring. The safety and benefits of moderate-intensity exercise training programmes were intensively investigated in supervised programmes. More recent data clearly indicates that unsupervised or home-based programmes are also safe and effective in appropriately selected patients. Furthermore, favourable effects of exercise training have also been demonstrated in patients with large myocardial infarctions, left ventricular dysfunction and even in heart failure.^{4,7,8,10,14,20–22}

The World Health Organization (WHO) has defined CR as the 'sum of activity and interventions required to ensure the best possible physical, mental, and social conditions so that patients with chronic or post-acute cardiovascular disease may, by their own efforts, preserve or resume their proper place in society and lead an active life'.² The goals of CR and secondary prevention are: (a) to prevent disability resulting from coronary disease, particularly in older persons and those with occupations that involve physical exertion, and (b) to prevent subsequent cardiovascular events, hospitalization, and death from cardiac causes. This is achieved through a programme of prescribed exercise and interventions designed to modify coronary risk factors with the use of optimised drug therapy and appropriate lifestyle changes. Thus, CR is not only indicated for incapacitated disabled patients but for all patients with a diagnosis of acute myocardial infarction, those who have undergone coronary revascularization (coronary artery by-pass graft -CABG-, percutaneous transluminal coronary angioplasty – PTCA), those with chronic stable angina, those with intermittent claudication, and those with documented coronary risk factors including hypertension, hypercholesterolemia and other abnormal conditions or diseases related to circulatory system. It is also appropriate for patients with chronic heart failure and those who have undergone cardiac transplantation.^{1,2,4,5,7,10–12,16,20–22}

During the past three decades, changes in the delivery of rehabilitative care for cardiac patients have reflected changes in demography and characteristics of the patients, and predominantly reflect

changes in clinical care. In the early years of CR, most patients enrolled in exercise training programmes were those who had recovered from uncomplicated myocardial infarction. In subsequent years, post-infarction patients with complications were also included and considered for more limited and gradual exercise rehabilitation. Many patients who currently receive rehabilitation services are recovering from CABG, PTCA or other forms of myocardial revascularization. With ageing of the population, cardiac rehabilitative care is now provided to a sizeable number of older-patients, many of whom have severe and complicated coronary illness and serious associated pathologies.^{4,5,12} Furthermore, many patients once considered to be too high risk for structured rehabilitation programmes, such as patients with residual myocardial ischaemia, compensated heart failure, serious arrhythmias, and implanted cardiac devices (pacemaker, ventricular resynchronization, ICD) currently derive benefit from more gradual and more protracted and often supervised exercise training.^{4,7,9,10,12,22} This is combined with education, counselling, behavioural strategies and other psychosocial interventions and vocational counselling strategies to assist the patient to achieve coronary risk reduction and other cardiovascular health-related goals.^{4,12}

There is convincing evidence that the combination of regular exercise with interventions for lifestyle changes and modification of risk factors favourably alter the clinical course of cardiovascular diseases. With continuing shortening of length of hospital stay, deconditioning is usually minimal but the time spent in hospital is no longer adequate to teach the skills required to monitor exercise activity, to cover the educational materials adequately and to adapt to the lifestyle changes necessary for these chronic conditions. Thus, the opportunity to counsel patients about risk reduction, exercise and healthy lifestyle is diminished, especially after PTCA and for young uncomplicated patients where length of hospital stay is particularly short. In this context, national clinical practice guidelines and reports of authoritative agencies of health care policy and research, have broadened the scope of CR programmes in regard to assessment and modification of risk factors, and have emphasised the greater need for structured outpatient rehabilitation programmes in the hospital, in the community environment or at home so that these programmes function as comprehensive secondary-prevention services.^{3,7,10–12,14}

Cardiac rehabilitation services for secondary prevention

On the basis of a comprehensive review of the scientific literature, including authoritative reports of the Working Group on Cardiac Rehabilitation and Exercise Physiology of the European Society of Cardiology, the European Societies on coronary prevention, the American College of Cardiology, the American College of Physicians, the American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation and a Cochrane review,^[1–4,7,8,12–15,22] this panel concludes that all interventions and CR services should be integrated in a multifactorial comprehensive long-term process that includes: clinical assistance and optimised medical or interventional treatment to relieve symptoms; appropriate cardiovascular risk evaluation; exercise training; education and counselling regarding risk reduction and lifestyle changes including the use of appropriate behavioural interventions and involvement of family members to achieve these changes; vocational counselling and adequate follow-up to assure long-term compliance and motivation for adherence to recommended lifestyle changes and pharmacological treatments. The more immediate objectives of CR services are to achieve clinical stability, limit the physiological and psychological effects of cardiac illness, improve the overall functional status and maintain independence with an emphasis on quality of life. In the longer term, the objectives are to reduce the risk of future coronary events, retard progression of the underlying atherosclerotic process and clinical deterioration, and ultimately reduce morbidity and mortality. Therefore, secondary prevention goals are included in the overall goal of CR, which in turn can be viewed as the clinical application of preventive care by means of a professional multidisciplinary integrated approach for comprehensive coronary risk reduction and global long-term care of cardiac patients as well as of high risk subjects with multiple risk factors.

The benefits and the preventive effects of CR as documented in the scientific literature are: reduction in symptoms, improvement in exercise tolerance and physical work capacity, improvement in blood lipid levels and global risk profile, reduction in cigarette smoking, improvement in psychosocial well-being and stress management, attenuation of the atherosclerotic process, decreased rates of subsequent coronary events, reduced hospitalization and decreased morbidity and total mortality. Despite these prominent benefits, fewer

than one-third of patients eligible for CR currently participate in formal rehabilitation programmes in most European countries.^{6,19} Barriers to participation in CR include resources, attitudinal and structural problems, the geographic maldistribution of available programmes, large distances, the lack of access to appropriate services and reimbursement issues for services or individual patients. Further barriers include the failure of physicians to assess the motivation of patients to lifestyle changes coupled with the poor ability to track the effective progress of prescribed lifestyle interventions, and the failure of physicians to refer patients, particularly older persons and women, to the available programmes. This is true despite the fact that physicians generally do not have the appropriate skills or the time to provide effective dietary interventions, weight management, smoking cessation, exercise prescriptions, psychosocial management and vocational counselling. Indeed CR is not yet a part of the core medical curriculum at many universities, either in basic medical education or in cardiology education. The provision of all these services at specialised CR units incorporating an integrated professional team approach (including cardiologists, nurses, exercise therapists, physiologists and/or sport teachers, psychologists, behavioural specialists, dieticians—all with appropriate training and experience) and setting goals for risk reduction in coordination with the primary care physician is both an efficient and effective way to deliver CR services.

Different patterns of rehabilitative care are currently delivered by specialised hospital-based teams: residential CR for more complicated, disabled patients; and outpatient CR for more independent, low risk and clinically stable patients requiring less supervision. There may be variations of individual or group programmes and centre-based or home-based programmes.

While the objectives are identical to those of the outpatient CR programmes, residential rehabilitation programmes are specifically structured to provide more intensive and/or complex interventions, and have the advantage being able to start early after the acute event, to include more complicated high risk or clinically unstable patients, to include more severe incapacitated and/or elderly patients (especially those with co-morbidity), and thus, to facilitate the transition from the hospital phase to a more stable clinical condition which may allow the maintenance of an independent life at home. One major disadvantage of residential programmes is the relatively short duration of intervention with regard to risk factor management and lifestyle

changes. Therefore, residential CR programmes should be followed up by a long-term outpatient risk reduction and secondary prevention programme, with appropriate clinical and functional monitoring. Home-based rehabilitation programmes directed by physicians and coordinated by nurses have also been developed as a way of expanding the delivery of secondary prevention services.

This panel strongly emphasises that CR programmes should consist of a multifaceted and multidisciplinary approach to overall cardiovascular risk reduction, and that programmes that consist of exercise training alone are not considered CR. It should be also recognised that exercise is often the vehicle for facilitating other aspects of CR, including coronary risk reduction and optimisation of psychosocial support. Thus, evaluation of the overall quality of life impact should become an integral part of outcome measures of rehabilitation.

Core components of cardiac rehabilitation/secondary prevention programmes are: baseline patient assessment; physical activity counselling and exercise training, nutritional counselling; risk factor management (lipids, hypertension, weight, diabetes, and smoking); psychosocial management, vocational counselling and optimised medical therapy. The way CR is delivered varies depending on national circumstances and resources. The provision of these services by specialised hospital-based teams in an out-patient setting is recommended, and a period of 8–12 weeks is considered adequate to cover the core components of cardiac rehabilitation/secondary prevention programmes appropriately. Shorter programmes may be considered under special circumstances but their efficiency is not proven in the literature. All patients after an acute cardiovascular event should be entered into a comprehensive, multidisciplinary intensive CR programme. On completion of this 'introductory' programme of secondary prevention, they should be oriented to a long-term maintenance regimen with the use of support systems such as coronary clubs, gymnasias or other facilities to promote long-term prevention strategies in the community.

The purpose of this statement is to provide specific recommendations in regard to evaluation and intervention in each of the core components of cardiac rehabilitation to assist CR staff in the design and development of their programmes; the statement should also assist health care providers, insurers, policy makers and consumers in the recognition of the comprehensive nature of such

Table 1 Core Components of Cardiac Rehabilitation/Secondary Prevention Programmes and Expected Outcomes 'adapted from Balady G.J. et al.¹² and Ades P.A.⁴'

Initial evaluation

- Take medical history and perform physical examination
- Measure risk factors
- Obtain electrocardiograms at rest and during exercise
- Determine level of risk
- Assess occupational status and prepare vocational counselling
- Goal: formulation of preventive plan in collaboration with primary care physician

Management of lipid levels

- Assess and modify diet, physical activity, and drug therapy
- Primary goal: LDL cholesterol level <100 mg/dl
- Secondary goals: HDL cholesterol level >45 mg/dl, triglyceride level <200 mg/dl

Management of hypertension

- Measure blood pressure on ≥2 visits
- If resting systolic pressure is 130–139 mmHg or diastolic pressure is 85–89 mmHg, recommend lifestyle modifications, including exercise, weight management, sodium restriction, and moderation of alcohol intake; if patient has diabetes or chronic renal or heart failure, consider drug therapy
- If resting systolic pressure is ≥140 mmHg or diastolic pressure is ≥90 mmHg, recommend drug therapy
- Monitor effects of intervention in collaboration with primary care physician
- Goal: blood pressure <140/90 mmHg (or <130/85 mmHg if patient has diabetes or chronic heart or renal failure)

Cessation of smoking

- Document smoking status (never smoked, stopped smoking in remote past, stopped smoking recently, or currently smokes)
- Determine patient's readiness to quit; if ready, pick date
- Offer nicotine-replacement therapy, bupropion, or both
- Offer behavioural advice and group or individual counselling
- Goal: long-term abstinence

Weight reduction

- Consider for patients with BMI >25 or waist circumference >100 cm (in men) or >90 cm (in women), particularly if associated with hypertension, hyperlipidaemia, or insulin resistance or diabetes
- Provide behavioural and nutritional counselling with follow-up to monitor progress in achieving goals
- Goal: loss of 5-10% of body weight and modification of associated risk factors with long-term adherence

Management of diabetes

- Identify candidates on the basis of the medical history and base-line test
- Develop a regimen of dietary modification, weight control, and exercise combined with oral hypoglycaemic agents and/or insulin therapy
- Monitor glucose control before exercise sessions and communicate results to primary care physician
- For newly detected diabetes, refer patient to primary care physician for evaluation and treatment
- Goals: normalization of fasting plasma glucose level (80–110 mg/dl) or glycosylated haemoglobin level (<7.0%) and control of associated obesity, hypertension, and hyperlipidaemia

Psychosocial management

- Identify psychosocial problems such as denial, depression, anxiety, social isolation, anger, and hostility by means of an interview, standardized questionnaire, or both
- Provide individual or group counselling, or both, for patients with clinically significant psychosocial problems
- Provide stress-reduction classes for all patients
- Provide family members interventions
- Goal: improvement of clinically significant psychosocial problems and acquisition of stress-management skills

Physical activity counselling and exercise training

- Assess current physical activity and exercise tolerance with monitored exercise stress test
- Identify barriers to increased physical activity
- Provide advice regarding increasing physical activity
- Develop an individualized regimen of aerobic and resistance training, specifying frequency, intensity, duration, and types of exercise
- Goals: increases in regular physical activity, strength, and physical functioning; more simply, at least 30 min of submaximal work or moderate exercise daily is recommended. Greater benefit however can be achieved by further increasing physical activity.

programmes. Core components of such programmes are outlined in Table 1.

Those charged with responsibility for secondary prevention of cardiovascular disease, whether at European, at national or at individual centre level, need to consider where and how structured programmes of CR can be delivered to the large constituency of patients now considered eligible for CR. The provision of such services, and provision to all who could benefit, is a standard of care that is now required on the basis of evidence for both service need for CR and service effectiveness. What is now needed at each level – European, national and local – is an action plan. While CR is widely agreed in an aspirational sense as a useful and evidence-based service, it needs an implementation plan if it is to become a reality for all patients who can benefit across Europe.

References

1. Recommendations by the Working Group on Cardiac Rehabilitation of the European Society of Cardiology. Long-term comprehensive care of cardiac patients. *Eur Heart J* 1992;13(Suppl C):1C–45C.
2. Rehabilitation after cardiovascular diseases, with special emphasis on developing countries: report of a WHO Committee. *World Health Organ Tech Rep Ser* 1993;831:1–122.
3. Wood D, De Backer G, Faergeman D et al. Prevention of coronary heart disease in clinical practice. Recommendations of the Second Joint Task Force of European and other Societies on coronary prevention. *Eur Heart J* 1998;19:1434–503.
4. Ades PA. Cardiac rehabilitation and secondary prevention of coronary heart disease. *N Engl J Med* 2001;345:892–902.
5. Pasquali SK, Alexander KP, Peterson ED. Cardiac rehabilitation in the elderly. *Am Heart J* 2001;142(5):748–55.
6. EUROASPIRE II Study Group. EUROASPIRE II. Lifestyle and risk factor management and use of drug therapies in coronary patients from 15 countries. *Eur Heart J* 2001;22:554–72.
7. Wenger NK, Froelicher ES, Smith LK et al. Cardiac rehabilitation. Clinical practice guideline. No.17 Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Agency for Health Care Policy and Research and the National Heart, Lung, and Blood Institute. AHCPR No. 96-0672. October 1995.
8. Fletcher GF, Balady G, Blair SN et al. Statement on exercise: benefits and recommendations for physical activity programs for all Americans. A statement for health professionals by the committee on exercise and cardiac rehabilitation of the council on clinical cardiology, American Heart Association. *Circulation* 1996;94:857–62.
9. Cobelli F, Tavazzi L. Relative role of ambulatory and residential rehabilitation. *Journal of Cardiovascular Risk* 1996;3:172–5.
10. Effective Health Care: Cardiac Rehabilitation. Effective Health Care Bulletins 1998; Vol. 4, no. 4 ISSN: 0965-0288: 1–12. Latimer Trend & Company Ltd., Plymouth.
11. Monpere C. Cardiac Rehabilitation: Guidelines and Recommendations. *Dis Manage Health Outcomes* 1998;4:143–56.
12. Balady GJ, Ades PA, Comoss P et al. Core components of cardiac rehabilitation/secondary prevention programs. A statement for healthcare professionals from the American Heart Association and the American Association of Cardiovascular and Pulmonary Rehabilitation. *Circulation* 2000;102:1069–73.
13. Smith SC, Blair SN, Bonow RO et al. AHA/ACC guidelines for preventing heart attack and death in patients with atherosclerotic cardiovascular disease: 2001 update. *Circulation* 2001;104:1577–9.
14. Fletcher GF, Balady GJ, Ezra A et al. AHA scientific statement: exercise standards for testing and training. *Circulation* 2001;104:1694–740.
15. Jolliffe JA, Rees K, Taylor RS et al. Exercise-based rehabilitation for coronary heart disease. The Cochrane Library, Volume (Issue 3) 2001.
16. Dugmore LD, Tipson RJ, Phillips MH et al. Changes in cardiorespiratory fitness, psychological wellbeing, quality of life, and vocational status following a 12 month cardiac exercise rehabilitation programme. *Heart* 1999;81:359–66.
17. Oldridge NB, Guyatt GH, Fischer ME et al. Cardiac rehabilitation after myocardial infarction. Combined experience of randomized clinical trials. *JAMA* 1988;260:945–50.
18. O'Connor GT, Buring JE, Yusuf S et al. An overview of randomized trials of rehabilitation with exercise after myocardial infarction. *Circulation* 1989;80:234–44.
19. Vanhees L, McGee HM, Dugmore LD et al. on behalf of the Carinex Working Group. A representative study of cardiac rehabilitation activities in European Union Member States: the Carinex Survey. *J Cardiopul Rehabil* in press.
20. Hambrecht R, Gielen S, Linke A et al. Effects of exercise training on left ventricular function and peripheral resistance in patients with chronic heart failure: A randomized trial. *JAMA* 2000;283:3095–101.
21. Belardinelli R, Georgiou D, Cianci G et al. Randomized controlled trial of long-term moderate exercise training in chronic heart failure: effects on functional capacity, quality of life, and clinical outcome. *Circulation* 1999;99:1173–82.
22. Giannuzzi P, Tavazzi L, Meyer K et al for the Working Group on Cardiac Rehabilitation & Exercise physiology and Working Group on Heart Failure of the European Society of Cardiology. Recommendations for exercise training in chronic heart failure patients. *Eur Heart J* 2001;22:125–135.